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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/957,468	09/20/2001	Mehrdad Nikoonahad	5589-02305	2660
35617	7590	08/03/2004	EXAMINER PHAM, HOA Q	
CONLEY ROSE, P.C. P.O. BOX 684908 AUSTIN, TX 78768			ART UNIT 2877	
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DATE MAILED: 08/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/957,468

Applicant(s)

NIKOONAHAD ET AL.

Examiner

Hoa Q. Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 May 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1413-1439, 1441-1445, 1447-1500, 1583, 1688, 1709 and 1751 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1413-1439, 1441-1445, 1447-1500, 1583, 1688, 1709 and 1751 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/23/03, 3/31/03</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. With respect to the amendment filed on 5/24/04, claims 1413-1439, 1441-1445, 1447-1500, 1583, 1688, 1709, 1751 are pending for examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1413-1420, 1424, 1433, 1436-1438, 1443, 1450-1451, 1478-1482, 1487-1488, 1500, 1583, and 1688 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maris et al (U.S. Pat. 5,748,318) in view of Tanimoto et al (U.S. Pat. 4,468,120).

Regarding claims 1413, 1450-1451, 1500, 1583, 1688, Maris et al discloses a sample stage (50,122) for supporting a sample (51), a measurement device (1) coupled to the stage which comprises an illumination system (10, 10', 10'', 10''', 40, 44) for directing light toward to surface of the sample, and a detection system (58, 60, 52, 54) coupled to the illumination system for detecting light propagating from the surface of the sample, wherein the measurement device generates one or more signals in response to the detected light, and a processor (66) coupled to the measurement device to determine a first property, a second property, and a third property, wherein the first property comprises a critical dimension (thickness) of the sample, the second property comprises a presence of defects and the third property comprises a thin film

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characteristic (stress, thermal, elastic, etc..) of the sample (see figures 1a-1c, 2, 16-18, and abstract). Maris et al does not explicitly teach that the defects comprise macro defects on a back side and front side of the specimen such as wafer; however, such a feature is known in the art as taught by Tanimoto et al. Tanimoto et al, from the same field of endeavor, discloses a foreign substance inspection apparatus in which the characteristic of defects on the front side of the specimen such as a wafer and the characteristic of macro defects on the back side and front side of the specimen are determined from the one or more signals in response to the detected light (see figures 2 and 6; column 4, lines 41-43; and column 8-9, lines 67-65). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the basic device of Maris et al to detect the defects present on the back side of the specimen as taught by Tanimoto et al if additional detection is desired. In addition, Maris et al teaches that the device could be used to detect various properties of the sample (column 9, line 66 through column 10, line 6).

Regarding claims 1414-1416, figures 16-18 and column 23, lines 6-16 teach that the stage is moved in X, Y, Z directions and rotated (tilted) in θ -direction.

Regarding claim 1417, figures 1a, 1b, and 2 show that a single light source (12) is used.

Regarding claim 1418, figure 1c teaches the use of two light sources (12,13).

Regarding claim 1419, figure 6 teaches the use of a photo-detector (60) is used.

Regarding claims 1420 and 1437, figure 2 shows the use of detectors 58 and 60.

Regarding claim 1424, see column 27, line 53, for the principle of reflectometry.

Regarding claims 1433, 1436, see column 27, line 53 and column 25, line 35, for ellipsometer embodiment.

Regarding claim 1438, the optical elements, for example, elements 34, 34, 48, 52, and 54 are used for both first measurement device and second measurement device.

Regarding claim 1443, see abstract for the fourth property (roughness).

Regarding claims 1478, 1480, and 1481-1482, using processor to generate database is inherent in the system of Maris et al and also the system is used to detect a plurality of samples.

Regarding claims 1479, 1487, 1488, see column 20, lines 35-43, for calibration of the system.

4. Claims 1421-1423, 1425-1432, 1434-1435, 1439-1442, 1444, 1445, 1447-1449, 1452-1477, 1483-1486, 1489-1499, 1709 and 1751 rejected under 35 U.S.C. 103(a) as being unpatentable over Maris et al and Tanimoto et al as applied to claims 1413-1420, 1424, 1433, 1436-1438, 1443, 1450-1451, 1478-1482, 1487-1488, 1500, 1583, and 1688 above, and further in view of Moore (5,872,632) and Kuriyama et al (4,865,445).

Regarding claims 1421-1423, 1425-1432, 1434-1435, and 1439, Maris et al teaches the use of ellipsometer or reflectometer as mentioned above and does not explicitly teach the use of scatterometer, probe microscope, dark-field and/or bright-field device, etc., however, such devices are well known in the art. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to

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include in or replace the optical inspection system of Maris et al by devices above if additional defects (i.e. micro defects and macro defects) and/or characteristics of the inspected object are detected. In addition, using such the dark-field and/or bright-field device, etc... would provide increased sensitive measurements of the surface of the specimen.

Regarding claims 1441 and 1442, Maris et al, column 8, lines 38-42, teaches that the thin film to be inspected may be an overlying of oxide, polymer or metal. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the basic device of Maris et al to detect the defects of a copper film because the device would function in the same manner.

Regarding claims 1444-1445 and 1447-1449, 1452-1477, and 1489-1493, Maris et al teaches that the sample comprises a thin film (84) disposed on the substrate (semiconductor wafer)(80) or SOI wafer. Maris et al does not explicitly teach that inspection system is coupled to process tool or processing chamber. However, such a feature is known in the art as taught by Moore. Moore, from the same field of endeavor, teaches that the inspection station (210) is coupled to the processing chamber (105) or reaction chambers (110,120,130) which are used for etching, depositing, annealing, etc...) (see figure 2, column 1, lines 11-17). It would have been obvious to one having ordinary skill in the art at the time the invention was made to arrange the inspection system of Maris et al in a cluster tool as taught by Moore. The rationale for this modification would have arisen from the fact that including the inspection system in the

cluster tool would save time required to move the substrate and take the substrate to a remote instrument as suggested by Moore (column 2, lines 1-7).

Regarding claims 1483-1486, 1495-1496, Kuriyama et al teaches the use of a plurality of measurement devices (100, 200) for measuring different properties of the object (see figure 3). Those of ordinary skill in the art at the time the invention was made to include in Maris et al a plurality of measurement devices as taught by Kuriyama if additional properties of the object are measured.

Regarding claims 1497-1499, 1709 and 1751, Maris et al teaches the use of computer to control and process the signals and discusses the use of local processors (column 23, lines 15-16 and 26).

Response to Arguments

5. Applicant's arguments filed 5/20/04 have been fully considered but they are not persuasive.

a. Applicant's remarks, page 16, argues that the cited art does not teach a "processor coupled to a measurement device and configured to determine a presence of macro defects on a back side of a wafer and a presence of micro defects or macro defects on a front side of the wafer from one or more output signals generated by the measurement device". The argument is not deemed to be persuasive because Tanimoto et al discloses a measurement device including an illumination system (8, 2, 3) and detection system (A, B), a processor (54-63, 110-134)) (figures 3, 6, and 16) for determining the presence of macro or micro defects on a front side or back side of the wafer (5) (figure 6).

b. Applicant's remarks, page 17, argues that Maris does not suggest the desirability of determining a presence of macro defects on a back side of a wafer. Applicant is noted that Maris teaches that the device is used to determine different types of properties of a wafer or a transparent layer (column 9, lines 66 through column 10, line 6, column 8, lines 34-45 and column 21, lines 1-26). On the other hand, the device of Tanimoto et al is used for detecting the defects on the front and back sides of a wafer or transparent layer. Since Maris suggest of measurement different types of properties and they are both from the same field of endeavor, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the basic device of Maris to determine the defects on the front and back sides of a layer as taught by Tanimoto et al.

c. Applicant's remarks, pages 18-19, argue that Tanimoto cannot detect defects on two sides of an opaque specimen such as wafer. The argument is not deemed to be persuasive because: (1) the present claimed invention does not recite an opaque specimen, claims must be examined on the basis of what they say, absent limitation may not be considered to be present; (2) the wafer does not have to be an opaque wafer because Tanimoto et al teaches that the transparent layer such as photomask is inspected and the photomask is a wafer (column 4, lines 41-43).

d. Kuriyama does not have to teach the defects on the front and back sides of the layer because such the limitation is taught by Tanimoto et al as mentioned above. Kuriyama suggest the use of different measurement devices for measuring different properties of a specimen.

In view of the foregoing, it is believed that the rejection under 35 U.S.C 103 is proper.

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Akiyama et al (4,541,715) and Hayano et al (4,999,510).

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

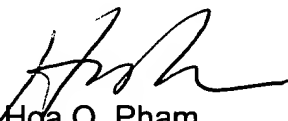
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoa Q. Pham whose telephone number is (571) 272-2426. The examiner can normally be reached on 7:30AM to 6 PM, Monday through Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on (571) 272-2800 ext. 77. The fax

phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Hoa Q. Pham
Primary Examiner
Art Unit 2877

HP
July 28, 2004